(Mis)Understanding Physics

Other

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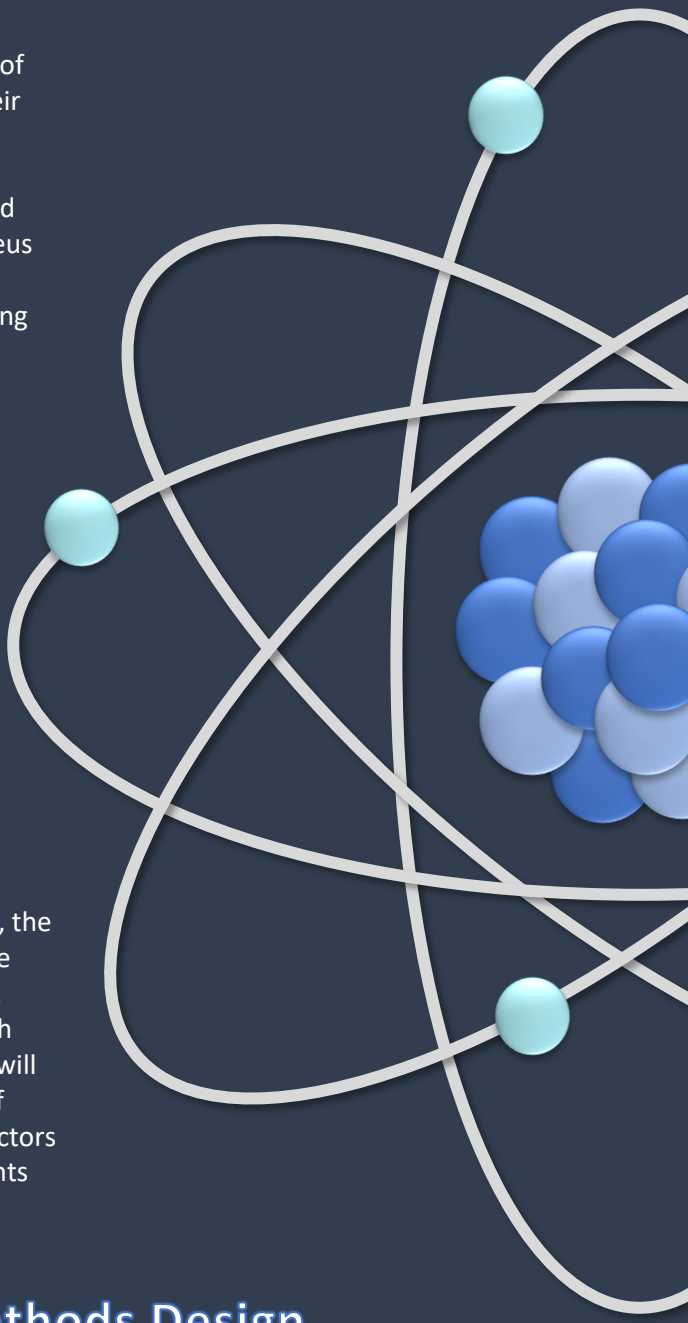
Katherine Langford, FASS katherine.langford@open.ac.uk

The Open University

Background

This study is investigating secondary school students' understanding of physics. Students do not passively absorb information. They have their own ideas which influence their learning. Physics is particularly problematic as it deals with concepts which are often abstract or counterintuitive. For example, students often struggle to comprehend how tiny an atom is or confuse the nucleus of an atom with the nucleus of a cell in biology. Once a student has a misconception, it can be extremely difficult to correct it as they often reject what they are being taught in preference of keeping their own incorrect theories. Understanding why students often struggle would assist with the development of effective teaching methods to address these issues.



Phase One

Physics is a vast subject, so it is first necessary to narrow down which topics will be studied. Preliminary interviews with six physics teachers have been conducted to establish which physics topics students find particularly tricky. All six teachers mentioned electricity, forces and radioactivity, so these are the topics this study will focus on. Excitingly, students' understanding of radioactivity has not been widely researched, so this study will potentially be breaking new ground.

Future Phases

To investigate how students' understanding of these topics develops, the next step is to design a quiz to assess their understanding. This will be done with the help of physics teachers and examiners who will break down the topics into the component parts that students struggle with and help to create the quiz questions. Students' answers to the quiz will then be examined using factor analysis to look for patterns, such as if students need to understand concepts in a particular order. Other factors will also be analysed, including what common misconceptions students have and which concepts students intuitively get right.

Multiphase Mixed Methods Design

Phase One

Thematic analysis of interviews with six physics teachers indicated that electricity, forces and radioactivity are particularly tricky topics for students to understand.

Phase Two

Questionnaires will be used with physics teachers and examiners to break down these physics topics further and develop quiz questions to examine students' understanding.

Phase Three

These quiz questions will be administered to students. Factor analysis will be used to examine their answers to see how their understanding of electricity, forces and radioactivity develops.

Phase Four

The quiz will be adapted into a resource that teachers can use with their students. Other teaching materials such as a teacher handbook will also be created.